Short-Range Load Forecasting Procedure

ComEd Administrative Procedure

AM-CE-3032

Revision No.: 4

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Core Function:	Capacity Expansion

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1. Purpose

1.1. The purpose of this procedure is to define the Short-Range Load Forecasting Process for distribution system feeders and substations. The information generated as a result of this process provides the projected loadings of the distribution facilities. These forecasts form the basis for the project plans and justifications that are developed for the two-year detailed budget and three year category level expenditure plan. Generally, the short range load forecasting process covers the 1 – 6 year time frame. Refer to AM-EU-09140 for the Long Range Distribution Capacity Planning Procedure.

1.2. This procedure is part of the implementation of the Company's response to the ICC Liberty Audit Recommendation 5-4.

2. Precautions and limitations

2.1. Precautions

2.1.1 The regional economy may fluctuate from historical trends, which may affect the load forecast.

2.1.2 There is margin of error with the weather adjustment factor.

2.1.3 A revision to this procedure shall not be made that would change the Company's performance on the actions committed to in response to the ICC Liberty Audit Recommendation 5-4 without the approval of the program commitment owner Vice President

2.2. Limitations

2.2.1 The data used to develop the short-range load forecast comes from external sources. If this data contains errors, the results of the short-range plan may be impacted.

3. Prerequisites

3.1. Ensure Area Planning Process AM-CE-P127 is followed.

4. Procedure

4.1. Feeder Short-Range Load Forecast – Summer and Winter Season

4.1.1 The Area Planner selects valid peak loads for feeders, substation transformers, and substation terminal in APT using the guidelines in AM-CE-P127-1.

4.1.2 Assess the validity of load additions by planning season and confidence level of new loads that have been provided by NEW BUSINESS or other resources.

4.1.3 Enter or update load addition information including customer type, PD number, SER number, data source, service date and magnitude associated with identified new business and planned load curtailments by feeder into APT. The effect of new or transferred feeder capacitors is entered from the "Search Actual Load" APT screen and is not treated as New Business. The Customer Types and Data Sources listed in Attachment AM-CE-3032-2 shall be utilized in APT.

4.1.4 Enter or update planned load transfers between feeders or line groups for forecast years 1 – 3 and between substation terminals for years 4 - 6 into APT.

4.1.5 The Planner does not enter or update the values for component Unidentified Load Growth in APT. This value will be determined after completion of the Load Growth Challenge Review. – (Summer only)

4.1.6 The Forecast Coordinator obtains the 90th percentile Summer weather Zone peak load forecast for the following five years and the base year actual Zone load from Financial Analysis and Planning.

4.1.7 After peak loads have been validated in APT according to AM-CE-P127-1 and Identified Load Additions have been entered or updated in APT, the Forecast Coordinator uses the INSITE tool to project feeder load growth for the three years following the actual peak load. – (Summer only)

4.1.8 After peak loads have been validated for selected components in APT according to AM-CE-P127-1, the Forecast Coordinator publishes a list of components that are projected to be outside of planning criteria for the current base year and base year N+1 – (Winter only)

4.1.9 Using the INSITE forecast analysis, feeder peak load growth is based on the following inputs: 1) the trend of the previous five years' weather and load transfer adjusted feeder peak load, 2) identified feeder new loads, and 3) the total risk adjusted non-coincident feeder load growth. (Summer only)

4.1.10 INSITE uses a knowledge-based calibration system to reduce identified load additions such that it minimizes the error that would result if no adjustment was made. - (Summer Only)

4.1.11 Following the Load Forecast Challenge (AM-CE-P127, Section 4.6), the Forecast Coordinator requests IT to update the feeder Unidentified Load Growth (UG) field with the selected load forecast less Identified New Business Load Growth (IG) in APT. The UG may be negative if the forecast is less than the IG or positive if the forecast is greater than the IG. – (Summer Only)

4.2. Substation Short-Range Load Forecast

4.2.1 The INSITE based total feeder load growth (identified and unidentified) from Section 4.1 is rolled up to substation transformers and terminals for 3 years (APT Official Plan) or 2 years (APT Validation Plan). A terminal to feeder coincidence factor is applied to the feeder load growth that is rolled up to transformers and terminals in the APT load forecast calculation. Identified or unidentified load growth is not applied to substation transformers or terminals for years 1 to 3. – (Summer Only)

4.2.2 INSITE forecasts substation terminal load growth for years 4 – 6 using identified feeder load additions and load growth trends in the five most recent years similar to the feeder growth forecast described in section 4.1.8. – (Summer Only)

4.2.3 APT calculates the substation terminal coincidence factor from the selected terminal peak load divided by the sum of the selected feeder peak loads. If abnormal system configuration or metering errors result in an unrealistic calculated coincidence factor, the Planner may enter a manual override for the APT terminal coincidence factor. This coincidence factor is applied to feeder load growth and load transfers that roll up to substation transformers and terminals.

4.3. Validation Of Forecast To Actual Loads – Summer Season Only

4.3.1 The Forecast Coordinator will extract from APT a list of feeders, lines, circuits and terminals that were either forecasted to be or actually loaded at 90% or greater of allowable loading limits (with weather adjustment applied). This is done after actual loads are validated in APT.

4.3.2 The Planner will provide the variance cause for those variances greater than or equal to +/- 10%.

4.3.3 The Planner will select from the following standard list of variance reasons Verify that these are all options:

- Growth estimating error (INSITE or Planner, non-specific customer related)
- Capacity relief not completed yet
- Weather adjustment error
- Emergency switching/curtailable/generator not accounted for
- SCADA conversion or other metering issue
- Load transfer estimate error
- New Business related (forecasted load addition changed, NB PD or transfer not completed)
- Customer load modification (Applies to existing customers only, Planner not informed of load increase or reduction))

- Capacitor(s) not on at peak
- Invalid prior year's load selection/Data
- Incomplete Non-Capacity Projects (Distribution Automation, Reliability, Facility Relocation, etc.)
- Network shift or load allocation adjustment
- Impacted Due To Distributed Energy Resources (DER)
- Other

4.3.4 Results will be reviewed by the Managers, Forecast Coordinator, and Planners and any deficiencies in the short term forecast process will be examined for opportunities to improve forecasting process accuracy. Opportunities may consist of improvement of procedures, process, and training.

5. Roles and responsibilities

5.1. Distribution Capacity Planner (Planner)

5.1.1 Reviews appropriate data, performs calculations, and projects peak loads for distribution components such as radial transmission lines, substations, and feeders.

5.1.2 Responsible for the normal configuration of the distribution system, including both long term and short term changes in response to new business and unidentified load growth.

5.1.3 Responsible for distribution substation capacity and distribution circuit loading.

5.2. Regional Distribution Capacity Planning Manager

5.2.1 Reviews and recommends short-range load forecasts for evaluation by the Capacity Planning Manager as part of the Area Planning process.

5.3. Distribution Capacity Planning Manager

5.3.1 Approves short-range load forecasts as part of the Area Planning process.

5.3.2 Owns the Capacity Expansion Category.

5.3.3 Owns the Short-Range Load Forecasting Process.

5.4. Forecast Coordinator

5.4.1 Responsible for operation of the INSITE tool to support the summer peak load forecast process.

5.4.2 Responsible for reporting winter components that violate planning criteria

5.5. New Business

5.5.1 New Business is responsible for receiving and responding to customer's requests including on-site relocation, new points of service, contracts, and estimates for the customers.

5.5.2 New Business is responsible to communicate timely information impacting system configuration and customer load additions to Capacity Planning. See AM-EU-3013 Distribution System Capacity Expansion and New Business Interface Procedure.

5.6. Regional Engineering

5.6.1 Regional Engineering is responsible to communicate timely information impacting system configuration to Capacity Planning. This is primarily the result of requests by Public Authorities for relocation of distribution system facilities.

5.7. Transmission Planning

5.7.1 Transmission Planning is the section within the Transmission Operations & Planning organization responsible for the overall planning, including short-range, of the transmission system. They are the design authority for system configuration and rating requirements for all transmission lines and substations.

5.7.2 Transmission Planning is responsible to communicate timely information impacting system configuration to Capacity Planning.

6. Documentation

6.1. Documentation generated during performance of this document shall be filed in accordance with Exelon Corporate Procedure LE-AC-401 – Records and Information Management Retention and Disposition.

7. Terms and definitions

7.1. Area Planning Tool (APT)

7.1.1 Database and analysis tool used to record substation and feeder load and capacity; circuit, substation transformer, and sub-transmission connectivity; planned load transfers; identified customer load additions and other pertinent information. It is also used to identify forecast future substation and feeder overloads.

7.2. Circuits, Lines And Feeders

7.2.1 Circuits include lines and feeders for the purpose of this procedure.

7.3. INSITE

7.3.1 An enhanced load forecasting tool that takes data from APT, normalizes total feeder forecasts with corporate forecasts and provides an improved algorithm for developing coordinated forecasts between areas, and improved accuracy for individual area, substation, and feeder forecasts. INSITE determines all unidentified growth based on historical load growth trends and identified new business data. The results of the INSITE forecast are used in the load growth challenge review. INSITE was developed and adapted for use at ComEd by Quanta Technologies, Raleigh NC.

7.4. Load Growth Challenge Review

7.4.1 Review of INSITE feeder and substation load forecasts together with alternate forecasts (if any) proposed by Planners based on their detailed knowledge of area load expectations. Planning Managers use the INSITE results and Planners' alternate forecasts to determine the load forecast that will be used for developing the Official Plan. This is then "locked in" and not subject to review in the Internal Review unless there is documented new evidence of a major change in load.

7.5. Terminal Coincidence Factor

7.5.1 The ratio of the selected substation terminal load to the sum of the selected non-coincident feeder loads for that terminal in APT. This value can be manually overridden if the calculated value is not realistic for projecting future loads. The maximum value is 1.0. This factor is applied to feeder load growth and load transfers that roll up to substation transformer and terminal load forecasts in APT.

7.6. Weather Adjustment

7.6.1 The process to determine the expected load at design weather conditions for a distribution substation transformer or feeder based on actual peak day load and weather conditions per AM-EU-09145.

8. References

8.1. LE-AC-401 – Records and Information Management Retention Disposition

8.2. AM-CE-P127 – Area Planning Process

8.3. AM-EU-09145 – Weather Adjustment Process

8.4. AM-EU-3013 – Distribution System Capacity Expansion and New Business Interface Procedure

8.5. AM-EU-09140 – Long-Range Distribution Capacity Planning

8.6. AM-EU-1062 – Capacity Expansion Forecast Variance Metric

9. Attachments

9.1. AM-CE-3032-1, Feeder Load Forecast Years 1 to 3

9.2. AM-CE-3032-2, Customer Load Growth Categories

10. Development history

Revision 0	Date: 11/17/2008
Writer	Michael Born, Principal Engineer, Capacity Planning
Reviewer(s)	Ken Jeppson, Senior Engineer, Capacity Planning; Frank Luedtke, Manager, Capacity Planning; Dan Schick, Manager, Capacity Planning; Ed Banas, Senior Engineer, Capacity Planning; Bill Dedic, Senior Engineer, Capacity Planning.
UFAM Approver(s)	M. Michelle Blaise, Capacity Expansion, Director
Reason written	Incorporates the use of the INSITE load growth analysis and forecasting tool for ComEd. Updated identified load growth categories. Separated load forecast challenge from capacity project challenge tasks. Adapted from EED procedure AM-ED-3002.

Revision 1	Date: 11/30/2012
Writer	Ken Jeppson, Senior Engineer, Capacity Planning
Review(ers)	Michael Born; Frank Luedtke; William Allen; Russell Desalvo ComEd Capacity Planning; Brian Camfield and George Karpuk PECO Capacity Planning
UFAM Approver(s)	William Gannon, Director, Engineering
Reason written	Add section on Forecast to Actual load growth validation

Revision 2	Date: 9/19/2014
Writer	Alex Westendorf, Engineer, Capacity Planning
Reviewer(s)	Frank Luedtke; Lap Dao; Russell Desalvo ComEd Capacity Planning;
UFAM Approver(s)	Michael Born, Manager, Capacity Planning
Reason written	Update format, change variance analysis range

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Revision 3	**Date: 9/15/2017**
Writer	Laura Whittington, Sr. Engineer, Capacity Planning
Reviewer(s)	Frank Luedtke; Marina Mondello; Sekou Sidime; Aleksi Paaso, Jim Stamatopoulos,ComEd Capacity Planning;
UFAM Approver(s)	Peter Tyschenko, Manager, Capacity Planning
Reason written	Add Winter load selection and forecasting

Revision 4	**Date: 9/21/2020**
Writer	Thai Tu-Sr. Engineer, Alvaro Berrocal-Engineer, Atif Mirza-General Engineer-ComEd Capacity Planning
Reviewer(s)	Frank Luedtke, Jim Stamatopoulos, Natalie Hammer, Brooks Glisson-ComEd Capacity Planning
UFAM Approver(s)	Marina Mondello, Manager, Capacity Planning
Reason written	General Document Review

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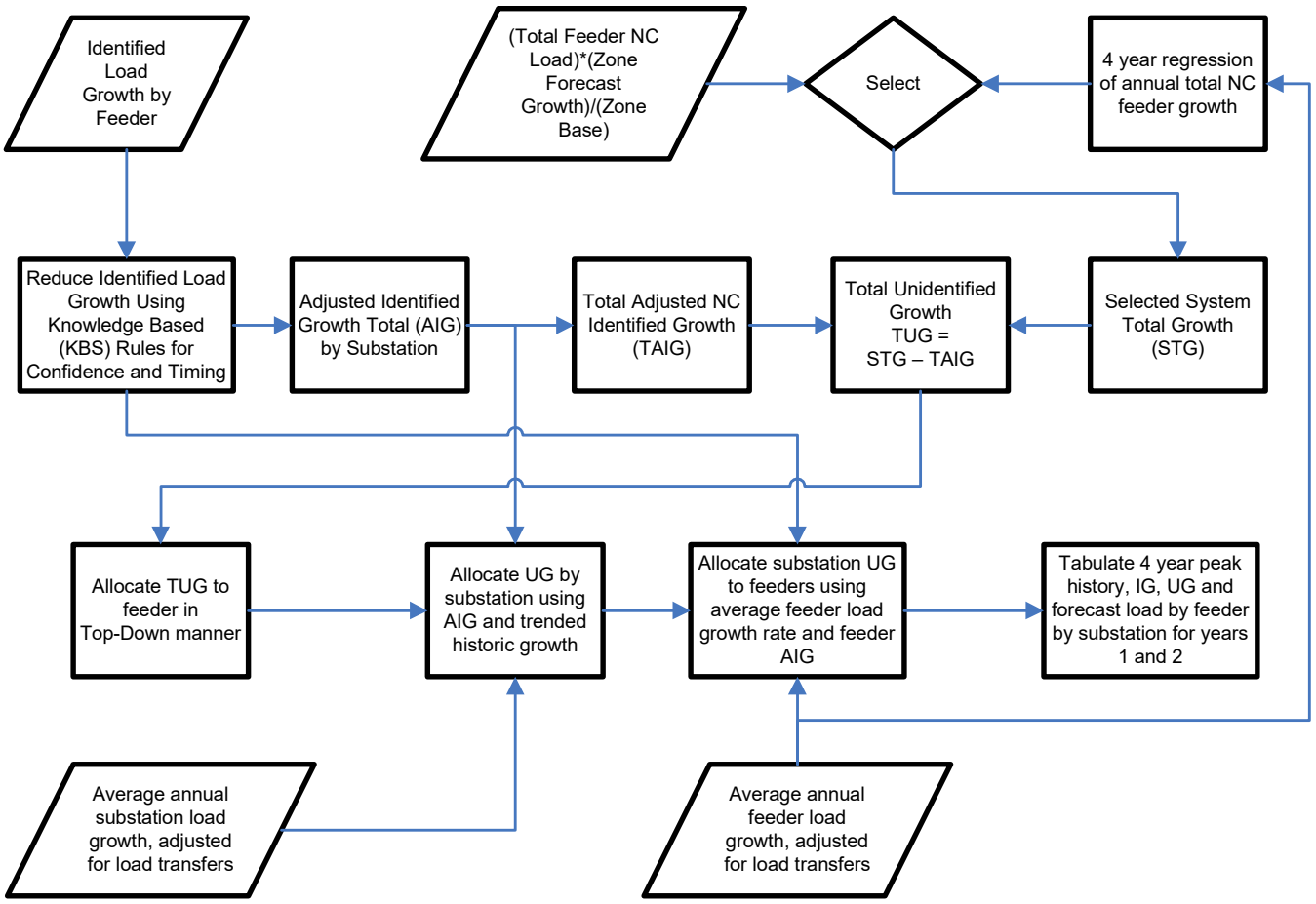
Feeder Load Forecast Years 1 to 3

INSITE Forecast Tool
2007 ComEd Implementation



Attachment AM-CE-3032-1

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Customer Load Growth Categories

Field	Acceptable Use	Examples
Customer Name	Subdivision name; Builder Name; Customer Name (required for load curtailment). Include name of development phase. Include address or location. Transformer number, if available.	"ComEd" not acceptable "Adjustment" not acceptable If Metrostudy, show subdivision name
Customer Type	• Residential • Small C&I (<1 MW) • Large C&I (1+ MW) • Curtailment • Chain/Nat'l • Spec Building	
Description	Nature of load addition and any other information useful to clarify the use of power. Customer account number can be included for later confirmation of load addition.	Do not repeat Customer Name Number of lots for subdivision. Single or multi-family for residential
Service Date	Date that the summer or winter estimated load will be in effect.	For multi-year projects, enter one load per summer/winter season.
Date Received	Date received from Info Provider (phone call, email, SR, CET)	Date most recent information was received.
Date Replied	Date Planning responded to Info Provider that capacity was adequate or that additional capacity was needed.	
Info Provider	Person that provided the information	
Position/Department	• NRCG • Regional NB • Acct Mgr • Metrostudy • Municipality • Media • Other	
Summer Load		Ignore loads less than 5 Amps
Winter Load		
Load Units	Amps or MVA	
SER Number	8 character SER number; CWA number, issued Design WO number, "email" or "phone" only.	
Project Diagram	8 character PD number only	Not to be used for account number or other information.

Attachment AM-CE-3032-2